

# PGM Effects for the BCT Commander



A Guided Multiple-Launch Rocket System test fires.

By MG (Retired) David C. Ralston  
and Patrecia Slayden Hollis

**T**he objective of US military kinetic operations always has been to defeat the enemy while minimizing risks to friendly forces, casualties among the innocent population and undesired collateral damage. Today, more than any era before, we have the technologies to achieve that objective across the spectrum of conflict. Even successful stability and nation-building operations have brief spikes of intensity calling for rapid, pinpoint lethality.

Force commanders require and have asked for precision indirect fire capabilities, and the Field Artillery (FA) is committed to providing those capabilities: tactical precision-guided munitions (PGMs). PGMs allow commanders to turn defeat into victory, save lives and minimize collateral damage.

In his survey of corps, division and brigade combat team (BCT) commanders, Major General (MG) Peter M. Vangjel, Chief of FA and Commanding General of Fort Sill, Oklahoma, reported that the maneuver commanders' fire support priority was precision. (See the "State of the Field Artillery 2007" by MG Vangjel in the September-December 2007 *Fires* online at [sill-www.army.mil/firesbulletin](http://sill-www.army.mil/firesbulletin).) The FA has been working diligently to answer the call.

The commander of ground forces in the highly successful Surge in Iraq in 2007, then Lieutenant General (LTG) Raymond T. Odierno, Commander of the MultiNational Corp-Iraq (MNC-I), endorses the effectiveness of the relatively new 155-mm Excalibur and Guided Multiple-Launch Rocket System (GMLRS) Unitary PGMs.

"...they were *extremely* effective. In fact, GMLRS and Excalibur were my brigade commanders' weapons of choice." (See the interview with LTG Odierno, "2007 Surge of Ground Forces in Iraq—Risks, Challenges and Successes," in the March-April 2008 *Fires*.)

We have entered a remarkable era of all-weather, all-terrain precision effects available to maneuver commanders 24/7 with Excalibur, GMLRS Unitary and the near-future Non-Line-of-Sight Launch System (NLOS-LS) Precision Attack Missile (PAM), projected to be fielded in fiscal year 2012 (FY12).

**Six Meters and Closing.** The indirect-fire PGMs are proving to be more accurate than the 10 meters required of a



PGM. Excalibur and GMLRS test results and combat records of their impacts catalogue their accuracy to within a six-meter radius of the intended targets, bringing us the closest we have been to a “one-round, one-hit” capability.

As the enemy was being cleared out of Baghdad, Iraq, during the 2007 Surge, many ran north to Baqubah in the Multi-National Division, North (MND-N) area of operations. Major (MAJ) Jack E. Vantress, the S3 of the 5th Battalion, 20th Infantry (5-20 IN), the lead task force (TF) during Operation Arrowhead Ripper in Baqubah, discusses Excalibur’s precision and how the TF got the desired effects on a two-story building in his email dated 17 December 2007.

“We fired two rounds nearly simultaneously.... Excalibur’s accuracy was such that the second round entered the building at the same point of impact as the first, thereby achieving the desired penetration to the first floor.”

Employed in conjunction with other joint firepower assets, Excalibur gives the enemy no way out. In July 2007, two Excalibur rounds were fired on a house containing top al Qaeda leader Abu Jura and 14 other insurgents in Arab Jabour south of Baghdad. An AH-64 Apache attacked a vehicle as insurgents fled from the rubble while an F-16 dropped two 500-pound bombs to destroy a house into which three insurgents had entered. The enemy never had a chance.

Colonel (COL) David B. Haight, Commander of the 3rd BCT, 10th Mountain Division, recently deployed his brigade

to Afghanistan. Before he deployed, he ensured his fires battalion had the capability to fire Excalibur.

“In June 2008, I went to the Fires Conference at Fort Sill and received a briefing on Excalibur—GPS-[global positioning system]-guided and extremely accurate. With Excalibur’s pinpoint accuracy, I can put one round into the bad guys’ exact location and take them out while causing minimum collateral damage and safeguarding the Afghan populace. Excalibur was exactly what we needed.

“We had identified an operational need for Excalibur, so we made the case for M777A2s in the brigade to fire the round—M777s are not organic to IBCTs [infantry BCTs]. FORSCOM [Forces Command] approved the request for the capability and resourced us with 12 M777A2 howitzers, which our 4-25 FAR quickly trained and certified on. The M777 has the added advantage of being lighter than the M198 and is very mobile; we can move it around the Afghan battlefield sling-loaded under a helicopter to fire Excalibur.” (Information is from a telephone interview 3 December 2008.)

Excalibur has become a joint and combined effort as both the Marines and Canadians are using it in theater.

In September 2005, 3-13 FA, 214th FA Brigade, fired GMLRS in support

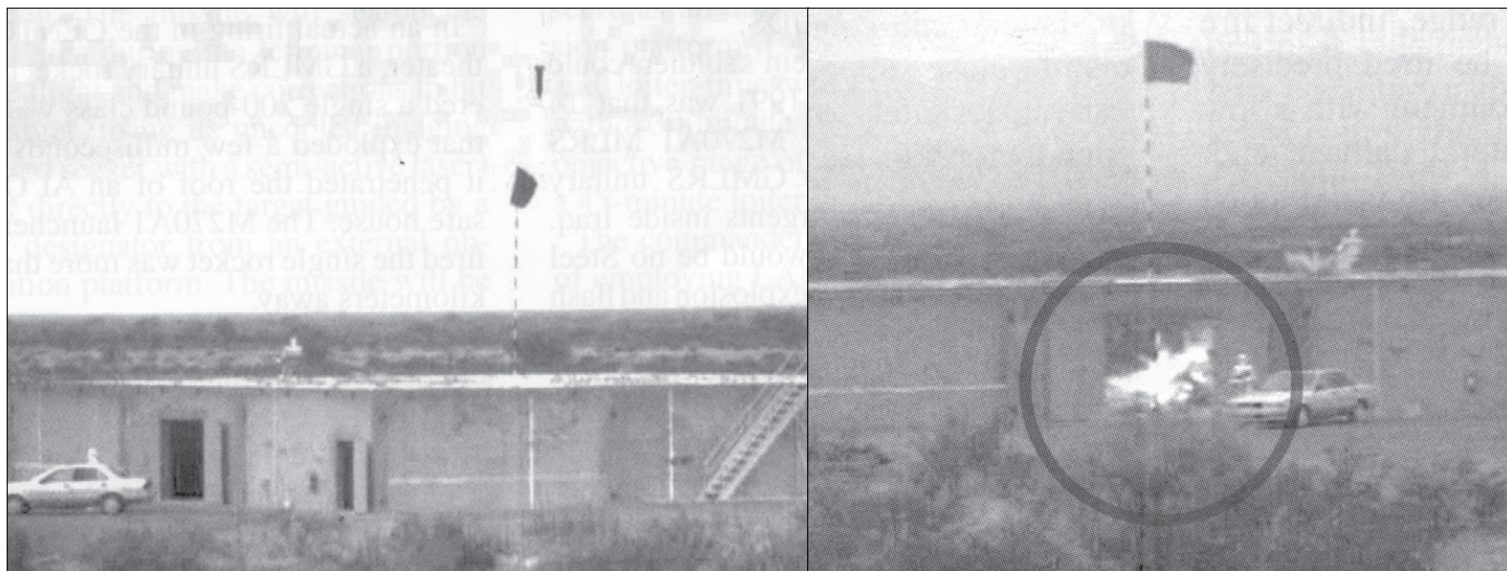
of MNC-I for the first time in combat during Operation Restoring Rights at Tal Afar and, the next day, during Operation Sayaid in the al Anbar Province. In Tal Afar, eight GMLRS destroyed two insur-

***Excalibur and GMLRS test results and combat records of their impacts catalogue their accuracy to within a six-meter radius of the intended targets, bringing us the closest we have been to a “one-round, one-hit” capability.***

gent strongholds and killed 48 insurgents from 50 kilometers away. In the al Anbar Province, six rockets destroyed a bridge used frequently by insurgents.

COL Kenneth J. Lull, former Commander of the 169th Fires Brigade of the Colorado Army National Guard that was the Force FA Headquarters for MND-N, the 25th Infantry Division (25th ID) in Iraq, reported experiences with GMLRS in Operation Arrowhead Ripper. “We shot more than 100 GMLRS in support 3-2 SBCT [3rd Stryker BCT, 2nd Infantry Division, attached to the 25th ID] in a two- to three-week period—a magnificent round.”

Aided by unmanned aerial vehicles (UAVs), combat observation lasing teams, forward observers (FOs), joint terminal attack controllers and other detection assets, you can use Precision Strike Suite-Special Operations Forces (PSS-SOF) software to locate the target precisely enough to fire PGMs quickly. PSS-SOF has been incorporated into



Still frame images taken from video footage show an incoming 155-mm Excalibur unitary round close to the dead-center of its target in a near-vertical descent after being fired on a structure from 22 kilometers away. The image on the right shows the round, functioning in the delay mode, detonating after penetrating a four-inch concrete roof.

Forward Observer Software and rapidly determines three-dimensional grid coordinates accurately enough to employ PGMs against time-sensitive targets or targets in support of troops-in-contact (TIC).

MAJ Vantress commented on the impact PGMs and PSS-SOF had on his TF operations during Operation Arrowhead Ripper in his email dated 17 December 2008.

"For both PGMs, our biggest combat multiplier was PSS-SOF. Used in combination with UAVs and FOs, we cut down the delivery time immensely. We loaded PSS-SOF in all our fire support Stryker variants to allow the forward fire support teams to quickly gain fidelity from their observers.

***"After they called in the fire mission, I asked the company commander exactly where the target was—it was two houses to the west of the one we were standing in. That is a testament to GMLRS that we called it in on a target 50 meters from our own location with great confidence."*** COL Bruce P. Antonia, former Commander of TF 5-20 IN

"Simply put, GMLRS and Excalibur were our weapons of choice in the close urban fight. They saved countless lives ... while allowing us to maintain the momentum."

This speaks not only to precision, but also to responsiveness.

Precision is the "coin of the realm" at the BCT and below. With Excalibur organic to BCTs, you have a PGM that allows small unit commanders to gain overmatch and a decisive advantage. In Operation Iraqi Freedom (OIF), BCTs have had MLRS or High-Mobility Artillery Rocket System (HIMARS) "packages" support them with GMLRS—also very responsively.

**Minimum Collateral Damage.** Precision munitions mean more than just accuracy of impact and effects on the intended target. PGMs provide precise effects with minimum collateral damage in the target areas. You can employ Excalibur, GMLRS and, starting in FY12 and in appropriate circumstances, PAM close to TIC safely for immediate fire missions. These munitions reduce troop standoff distances, giving you the option of, say, entering a building to collect time-sensitive intelligence just seconds after you engage the building.

COL Lull told about experiences employing Excalibur as well in Iraq. (Information provided in an 18 November 2008 email.)

"We fired 17 Excalibur rounds for the 3-2 SBCT when it cleared Baqubah of insurgents in intense combat during Operation Arrowhead Ripper. In one mission, we fired Excalibur on a known enemy safe house. Although it did not level the building, it killed everyone in the building without harming the children about 30 yards away playing outside in the front of the next house.

"Excalibur is an *incredible* round.... I called MNC-I and asked for every Excalibur round I could get my hands on."

Brigadier General Stephen J. Townsend, Commander of 3-2 SBCT during Operation

Arrowhead Ripper, talked about employing GMLRS to detonate improvised explosive devices (IEDs) in Baqubah in his email dated 16 December 2008. The alternative was

to uncover and destroy the deep buried IEDs (DBIEDs) or house-borne IEDs (HBIEDs) with successive shots *manually* emplaced by an explosive ordnance disposal (EOD) team.

"Our pre-assault intel proved quite accurate—that we faced up to 175 DBIEDs and also booby-trapped houses, or HBIEDs, in Baqubah. By the time we were done, we had recorded more than 200 emplaced IEDs inside the city and about 41 rigged houses.

"We were desperate for a solution to the problem of DBIEDs—al Qaeda had been able to dig in an overlapping network of DBIEDs, sort of the equivalent of a deliberate interlocking minefield in depth. Bottom Line: GMLRS worked by neutralizing known and suspected DBIEDs and allowed us to maintain the momentum of our attack with minimum exposure to our force and minimum collateral damage to the Iraqi infrastructure."

COL Bruce P. Antonia, the former Commander of TF 5-20 IN, and his Sykes' Regulars fought in Baqubah three months before the rest of 3-2 SBCT joined them in June 2008 for the final assault to clear the city. In an email dated 17 December 2008, he talked about being able to shoot

GMLRS faster than he could air-drop a bomb on HBIEDs and the level of comfort they developed with GMLRS' accuracy and effectiveness.

"We were in the midst of clearing a neighborhood when one of my companies came upon a confirmed HBIED. I was on the ground with the company commander when he requested GMLRS to attack the HBIED. Because there was direct fire contact with the enemy and I was extremely confident in my commanders and all my FSOs [fire support officers], I immediately agreed to the request.

"After they called in the fire mission, I asked the company commander exactly where the target was—it was two houses to the west of the one we were standing in. That is a testament to GMLRS that we called it in on a target 50 meters from our own location with great confidence."

The United Kingdom has modified 12 of its M270 MLRS launchers to employ GMLRS Unitary in Afghanistan. In the past year, the UK has fired more than 300 GMLRS rockets in Afghanistan with the same 98 percent reliability as US missions enjoy.

**Coming Soon: Moving Target Attack.** In 2012, you will have a PGM organic to your BCT that will add a long-needed capability to attack *moving* targets—PAM—a global first.

This Army-Navy all-terrain, 24/7 missile will have an effective range of from 500 meters to 40 kilometers. Each of the 15 missiles per PAM container-launch unit (CLU) has an explosive shaped-charge warhead for armored targets with fragmentation for soft targets. PAM is designed to attack armored and lightly armored *moving* and stationary vehicles, small boats and some bunkers with pinpoint accuracy. Causing minimum collateral damage, it will be able to be employed in urban/complex terrain less than 110 meters from friendly forces.

PAM has a dual-mode seeker: the semi-active laser (SAL) and infrared (IR) heat seeker can be used separately or together for precision target engagement after its GPS navigation has guided the missile to the target area.

Networked and platform-independent, PAM is a smart missile. It can acquire specific types of targets in flight and attack them, including moving targets.

A missile flies along a non-ballistic route to the target to avoid crowded airspace and receives target location updates while in flight. Each missile transmits a picture of the target back to the control cell just prior to impact.



NLOS-LS completed nine tests in 2008 that have demonstrated its design and performance parameters. In November at White Sands Missile Range, New Mexico, it used its digital SAL seeker to score a direct hit against a T-72 tank from a range of nine kilometers; two days later, it demonstrated its SAL and IR seekers for another direct hit on a T-72, this time from 19 kilometers away.

The Army is considering an air defense application for this munition, which has tested very well to this point. The variant would fill the requirement to destroy low- and slow-moving UAV and rotary-wing threats, protecting the future combat system (FCS) BCT, the FBCT, during counterinsurgency operations. No current organic capability protects the brigade from these threats.

**... the Current Fight.** These PGMs are designed to give you the flexibility to manage the precision effects to achieve your desired results. Excalibur has a 50-pound warhead and GMLRS Unitary a 200-pound warhead, which can be employed against larger targets, yet both can be employed in close support of friendly troops. (PAM will have a 12-pound warhead and also will be employable in close support of your troops.)

Indirect fire PGMs will allow you to attack an enemy mortar crew setting up in downtown Kabul with Excalibur and produce minimum collateral damage or destroy a two-story duplex with GMLRS

Unitary, leaving the other half of the duplex standing. To increase your precision strike flexibility, the FA is developing “scalable lethality”: a future GMLRS “dial-an-effect” capability.

You can fire Excalibur from as close as 7.5 kilometers and GMLRS from as far away as 70-plus kilometers. The Marines in Iraq first gave GMLRS its now-famous title of “70-kilometer sniper rifle.” With the fielding of PAM, you will be able to fire the missile from as close as 500 meters from the target.

Enhancements to Excalibur due in FY10 extend the round’s range to 35 kilometers on current firing platforms. When PAM comes into the inventory in FY12, you will be able to precisely attack moving targets from 40 kilometers away.

In the past two years, two operational needs statements from Central Command commanders have called for a 120-mm mortar PGM in theater—another precision strike option to fill a gap. A mortar PGM would be highly mobile; organic to maneuver battalions and, therefore, responsive; and reduce the system-to-target range while still maintaining a maximum range that ensures munition versatility.

Recently, an IBCT fires battalion was tailored with attached M777A2s to

provide a capability to deliver PGMs in Afghanistan (4-25 FAR). This organization, for the first time, provides the IBCT commander with the ability to deliver precision munitions without waiting on an external asset to deliver long-range precision.

Lieutenant Colonel (LTC) Michael P.

***PAM is designed to attack armored and lightly armored moving and stationary vehicles, small boats and some bunkers with pinpoint accuracy. Causing minimum collateral damage, it will be able to be employed in urban/complex terrain less than 110 meters from friendly forces.***

Gabel, Commander of 4-25 FAR, 10th Mountain Division, deployed to Afghanistan in late 2008. He talked about tailoring his FA battalion to fire Excalibur (email 9 December 2008).

“My 3rd BCT was in OEF [Operation Enduring Freedom] VI and VII. It was the first brigade in Afghanistan to have its rotation extended to 16 months. The good news is we brought back a lot of lessons—for example, the importance of range and firepower in that mountainous terrain.

“During OEF VI and VII, the artillery had to fire its M119 [105-mm] howitzers at high angle with max charge to get the range it needed in that terrain. So for our 2009 rotation, we requested and



The US Marines fire the GMLRS Unitary from their High-Mobility Artillery Rocket System (HIMARS) in Iraq.

got 12 [155-mm] M777A2s—not only to increase our range and firepower, but also to improve our precision and limit collateral damage in urban operations with the Excalibur round.

“We reorganized into a multicapable battalion with 12 Triple sevens and kept four M119s for air assault operations. (I turned HHB [headquarters, headquarters battery] into an M119 platoon.) We shot 15,000 rounds under this organization in preparation for deployment. I think this multi-capable FA battalion organization may be the way to go—it gives maneuver commanders options. We’ll know better after we have been in Afghanistan for awhile.”

These PGMs are not only all-weather, but also all-terrain, effective in urban, complex, mountainous or open terrain. Because of their near-vertical angle of attack, these weapons optimize lethality and minimize collateral damage.

The reduced collateral damage permits their use and their ability to deliver the desired effect within the rules of engagement in some of the most complex terrain.

With Excalibur’s non-ballistic trajectory, it is not limited to clear fields of fire or tied to gun-target lines—it can be fired up to 300 miles off the line and

will maneuver to hit whatever target the maneuver commander wants to hit.

Army and Air Force command systems can be automated to deconflict airspace faster and more accurately than ever. The Advanced FA Tactical Data System now shares information through the Battlefield Coordination Detachment to Air Force systems to provide airspace information, enabling rapid coordination to deconflict flight routes in the vicinity of a PGM trajectory.

The lower the level of the release authority of the tactical PGM, the faster its fires are cleared. When clearance and control of Excalibur is delegated down to the TF commander, “it is more responsive than CAS [close air support] or attack aviation,” said LTC Stephen J. Maranian, whose attached M777A2 battery (from 3-321 FA, 18th Fires Brigade) fired Excalibur (email dated 11 November 2008). LTC Maranian commanded 4-319 AFAR, part of the 173rd Airborne BCT, in Afghanistan from the summer of 2007 until July 2008.

COL Charles A. Preysler, recent commander of the 173rd Airborne BCT in Afghanistan, said “[Excalibur] worked as advertised.... Once we understood the time required to fire the round, it became clear we needed to get permissions and authorities down to the battalion level.”

Because the risk of collateral damage associated with these PGMs is smaller, PGMs such as Excalibur and GMLRS allow the commander to delegate release authority for entire categories of targets down the chain of command.

For large scale precision, USAF PGMs are brought to you by your FSO. In addition to the FA suite of PGMs, you have the

option of air-delivered PGMs, such as the Small-Diameter Bomb (SDB) with a 250-pound warhead and the Joint Direct Attack Munition (JDAM) with options

***You can fire Excalibur from as close as 7.5 kilometers and GMLRS from as far away as 70-plus kilometers. The Marines in Iraq first gave GMLRS its now-famous title of “70-kilometer sniper rifle.” With the fielding of PAM, you will be able to fire the missile from as close as 500 meters from the target.***

for 500-, 1,000- and 2,000-pound warheads. These weapons are precise in their destruction of larger infrastructure or concentrations of enemy forces. The only aerial-delivered munition that equals the limited collateral damage estimates of Excalibur, GMLRS Unitary or PAM is the Hellfire missile.

See the sidebar, “Excalibur and GMLRS Unitary Stats and Specs” for more information.

**Excalibur Lessons Learned.** While GMLRS has been in the inventory and well-appreciated for several years now, Excalibur is relatively new and often unfamiliar to BCT commanders.

LTC Maranian (Commander of 4-319 AFAR) talks about several lessons he learned about Excalibur in Afghanistan (email dated 11 November 2008), which have been echoed by other FA commanders.

“We need to educate our maneuver counterparts that Excalibur is *not* Copperhead. Copperhead has left some ‘scar tissue’ with maneuver battalion commanders from their days as company commanders as they remember the cumbersome nature of that old PGM.

“Further, the default is that commanders want to fire two Excalibur rounds in case one fails. Needless to say, the TF FSOs and FSCOORDs [fire support coordinators] need to coach their maneuver commanders that while there are times when more than one Excalibur should be employed to achieve the desired effects, the reliability of this round far exceeds that of Copperhead, and we do not need to default to firing more than one round. Our experience was that Excalibur had an accuracy of within six meters of the target.

“With the right target selection standards and delegation of release authority to the TF level, Excalibur can provide reliable first-round accuracy for TIC when collateral damage must be minimized.”



US Soldiers fire an Excalibur round from the M777A2 in support of Operation Enduring Freedom. (Photo courtesy of Combat Camera)

Other critical lessons—intelligence and precise target location are paramount for employing PGMs effectively. You must have the intelligence that the target is high-payoff and locate the target precisely or the PGM will attack a no-value target or the wrong location *precisely*.

Last, it is important to know what Excalibur will and will not do. It will not level most buildings, but it can destroy the rooms inside a building while causing very little collateral damage. This munition is effective against softer targets.

Today, Excalibur and GMLRS provide BCTs all-weather, day and night responsive precision strike capabilities on planned and unplanned targets in all terrain—PGMs that are organic to your brigade or readily available in the ground force. In the near-future, PAM will bring an additional precision strike capability to the BCT—the attack of moving targets. Together, they give you precision effects and range options and reduce your collateral damage and logistical burden.

The Field Artillery continues to work on precision indirect fire for the future, as voiced by the current Chief of FA, MG Vangjel: “As your fire supporters, we are totally committed to giving you the precision strike capabilities you need—we won’t let you down.”

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**Major General (Retired) David C. Ralston** was the Chief of FA and Commanding General of Fort Sill, Oklahoma, from August 2005 to September 2007 when he retired. As Chief of FA, he accelerated the fielding of Guided Multiple-Launch Rocket System (GMLRS) Unitary and Excalibur in Central Command after combat commanders issued urgent needs statements for the munitions. He was the Director of Force Management, G3, at the Pentagon; Assistant Chief of Staff for Operations in Kosovo; and Commander of the 1st Cavalry Division Artillery at Fort Hood, Texas. He holds an MA from Central Michigan University and was an Army Senior Service Fellow at Harvard University. Currently, he is Director of Government Liaison with Stanley Associates and a partner in

**TDRS Consulting in Lawton, Oklahoma.** His daughter, Amanda, and son, Mark, are deployed to Iraq.

**Patrecia Slayden Hollis**, who retired in late 2007, is the former Editor of *Field Artillery* for 20 years and first Editor of *Fires*. She has interviewed more than 80 senior US and international military leaders for publication, one of her most recent with (then) Lieutenant General Raymond T. Odierno, Commander of the MultiNational Corps-Iraq: “2007 Surge of Ground Forces in Iraq—Risks, Challenges and Successes,” March-April 2008 *Fires*. In 2006, she won the six-state Katie Award and statue from the Dallas Press Club for her interview with Lieutenant General John F. Sattler, USMC, commander of US and Coalition Forces during the “Second Battle of Fallujah—Urban Operations in a New Kind of War,” March-April 2006 *Field Artillery*, among other writing awards. She holds an MA from George Washington University.

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## Excalibur and GMLRS Unitary Stats and Specs

**XM982 Excalibur.** This is the first Global Positioning System (GPS)-guided, inertial measurement unit (IMU)-aided weapon that can be fired from 155-mm platforms, including the M109A6 Paladin, the M777A2 towed howitzer and the Future Combat Systems Non-Line-of-Sight Cannon (FY17).

Excalibur is an extended-range (7.5 to 24 kilometers) unitary round that is all-weather, 24/7 and all-terrain and has been fired in testing and combat with an accuracy of within a six-meter radius of the target.

Excalibur has two special force-protection features. First, the round only arms itself when it is within 30 meters of the aimpoint—extra safety for rounds in close support of your troops. Second, the round has a built-in test that it exercises in flight. If it detects a problem, it goes into fail-safe mode and flies to a preplanned alternate ballistic impact point (BIP) but does not detonate.

Its 50-pound warhead has a highly concentrated and predictable fragmentation pattern, optimizing it for urban operations and minimizing collateral damage, allowing it to be employed within 170 meters of friendly troops in combat. Its non-ballistic flight trajectory that terminates in a near-vertical attack angle along with its precision produces concentrated lethality to the equivalent of the M107 high-explosive round.

The XM982 can penetrate a four-inch reinforced concrete building and destroy the contents of the rooms without damaging structures around it. By design, it does not level the building—just penetrates the building and detonates to destroy the rooms inside.

Its primary target sets are softer targets: artillery and mortar crews, vehicles and command posts, although Excalibur has been employed successfully against other targets in support of Coalition Forces. In Central Command, Excalibur has been effective against improvised explosive devices (IEDs), safe houses, mortar crews, footbridges and other targets.

**M31 Guided Multiple-Launch Rocket System (GMLRS) Unitary.** Fired by the M270A1 MLRS launcher and the M142 High-Mobility Artillery Rocket System (HIMARS), GMLRS Unitary has been highly successful in Iraq and Afghanistan in the War on Terrorism. It has a 200-pound preformed fragmentation warhead and a range of from 15 to 70 kilometers. To date, more than 1,000 IMU-guided, GPS-aided GMLRS have been fired in Iraq and Afghanistan since its initial limited 2005 fielding in Iraq. Many of these rockets were fired safely with impacts within 200 meters of friendly troops.

Its original primary targets sets are self-propelled and towed howitzers, logistical sites, command posts, radars and other non-armored targets. In CENTCOM, it has been employed effectively in congested urban environments against concrete buildings or structures, intersections, deep-buried IEDs and house-borne IEDs.

You can fire up to six rockets (five-second intervals) at six different aimpoints in the target area from MLRS or HIMARS. The launcher parks, lays, aims and fires the rockets in as fast as five-second salvos, automatically programming each rocket to its coordinates.